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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/664,247

09/17/2003

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EXAMINER

ROSASCO, STEPHEN D

ART UNIT

PAPER NUMBER

1795

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/664,247	<b>Applicant(s)</b> STEWART ET AL.	
	<b>Examiner</b> Stephen Rosasco	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 18 December 2007.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) 16-25 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>10/25/04, 6/14/04, 3/14/05, 2/17/04</u> .                     | 6) <input type="checkbox"/> Other: _____                          |



### Detailed Action

Applicant's election without traverse of Group I (claims 1-15) in the reply filed on 12/18/07 is acknowledged.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 1 is rejected under 35 U.S.C. 102(e) as being clearly anticipated by Lowrey et al. (5,208,125).

Lowrey et al. (see claims 9+) teach a method of forming a reticle for use in semiconductor photolithography comprising: forming a pattern of ion implant areas on a transparent substrate by ion bombardment of the substrate with an ion dopant selected to change an absorption property of the substrate and form opaque light blockers in the substrate in a repetitive pattern to define an image for photopatterning with the opaque light blockers having light transmissive areas therebetween; and forming a second pattern of ion implant areas on the substrate by ion bombardment with an ion dopant selected to change an index of refraction of the substrate to form phase shifters for producing a phase shift of light with the phase shifters and light transmissive areas aligned with respect to

the opaque light blockers to cancel light diffracted from the opaque light blockers and improve a projected image during photo patterning.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 7, 8, 13, 14 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lowrey et al. (5,208,125) in view of Asano et al. (6,335,129) and Neary et al. (6,016,357).

Lowrey et al. is included here as discussed above.

The teachings of Lowrey et al. differ from those of the applicant in that the applicant teaches in claims 2, 4, 9, 10, and 13-15 the use of an aerial image view of the defective area of the mask, and in claim 3, the step of thinning of an area of the substrate to alter the phase of transmitted light.

Asano et al. teach a method for repairing a pattern defect comprising: (a) determining the irradiation area for an ion beam directed towards a defect pattern film material formed on a mask substrate, the defect pattern film material being an opaque material different from a transparent material of the mask substrate, by narrowing the

irradiation area by a predetermined distance inwardly from the edge of the defect pattern film material; (b) focusing the ion beam onto its irradiation area to remove a part of the defect pattern film material from its surface so as to leave a thin layer of the defect pattern film material on the mask substrate, configured such that the ion beam does not attack a surface of the mask substrate; and (c) removing only the thin layer by using a laser beam so as not to ablate a normal pattern film material neighboring the defect pattern film material, the normal pattern film material being made of the opaque material.

Asano et al. also teach (see col. 9, lines 6+) FIG. 8A illustrates a profile of the image intensity on a wafer taken along the line VI-VI of FIG. 6D(a) when the laser of wavelength of 248 nm is focused through a mask pattern repaired by the method of the first embodiment of the present invention. The profile of the image intensity can be measured using an aerial image measurement system for various defocus positions of 0.0,  $\pm 0.2$ ,  $\pm 0.4$ ,  $\pm 0.8$ , and  $\pm 1.0$   $\mu\text{m}$ . Characteristic examples of the image measurement system applicable for the purpose include a Carl Zeiss Microlithography Simulation Microscope ("MSM-100").

Also the applicant discloses the state of the prior art in section [0018] of the specification - Basically the gallium implanted during scanning, at certain doses, is sufficient to reduce transmission or reflectivity, akin to material depositions. Another example, which is known in the art, is to repair missing phase shift material by reducing the thickness of the substrate at the defect area, rather than depositing additional phase shift material. The thinned area also shifts the phase of the transmitted light relative to unpatterned substrate.

Neary et al. (see claims 9+) teach a method of repairing a semiconductor phase shift mask comprising the steps of:

- a) providing a semiconductor phase shift mask having a defect;
- b) illuminating said mask to create an aerial image of said mask;
- c) analyzing said aerial image of said mask;
- d) detecting said defect in said mask from said aerial image;
- e) providing a look-up table having information on patch properties;
- f) determining unique attenuating patch parameters for repairing said mask defect utilizing the aerial image analysis and information from said look-up table; and
- g) applying to said mask an attenuating patch corresponding to said parameters to repair said mask defect.

And wherein step (c) includes analyzing the aerial image by defining an ideal mask image and step (d) includes comparing the ideal mask image to the aerial image of said mask created in step (b).

And wherein said aerial image of step (b) is analyzed in step (c) by defining a constant intensity contour of said aerial image corresponding to a predetermined value required to print said aerial image in a lithographic process.

It would have been obvious to one having ordinary skill in the art to take the teachings of Lowery et al. and combine them with the teachings of Asano et al. and Neary et al. in order to make the claimed invention because it would have been obvious to one in the art to use the techniques of aerial imaging of Neary et al. and the thinning by etching of Asano et al. for the known advantages of these techniques.

### *Conclusion*

Art Unit: 1795

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Stephen Rosasco whose telephone number is (571) 272-1389. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM. The Examiner's supervisor, Mark Huff, can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/S. Rosasco/  
Primary Examiner, Art Unit 1795

S.Rosasco  
3/18/08